

University of Vermont ScholarWorks @ UVM

University Libraries Faculty and Staff Publications

University Libraries

1-2010

Information-seeking Behavior of Basic Science Researchers: Implications for Library Services

Laura L. Haines

University of Vermont, lhaines@uvm.edu

Jeanene Light

University of Vermont, jlight@uvm.edu


Donna O'Malley

University of Vermont, domalley@uvm.edu

Frances A. Delwiche

University of Vermont, fdelwich@uvm.edu

Follow this and additional works at: <http://scholarworks.uvm.edu/libfacpub>

 Part of the [Higher Education Commons](#), and the [Library and Information Science Commons](#)

Recommended Citation

Haines, Laura L.; Light, Jeanene; O'Malley, Donna; and Delwiche, Frances A., "Information-seeking Behavior of Basic Science Researchers: Implications for Library Services" (2010). *University Libraries Faculty and Staff Publications*. Paper 8.
<http://scholarworks.uvm.edu/libfacpub/8>

This Article is brought to you for free and open access by the University Libraries at ScholarWorks @ UVM. It has been accepted for inclusion in University Libraries Faculty and Staff Publications by an authorized administrator of ScholarWorks @ UVM. For more information, please contact donna.omalley@uvm.edu.

Information-seeking behavior of basic science researchers: implications for library services

Laura L. Haines, MLS; Jeanene Light, MLS; Donna O'Malley, MSLIS; Frances A. Delwiche, MLIS

See end of article for authors' affiliations.

DOI: 10.3163/1536-5050.98.1.019

Objectives: This study examined the information-seeking behaviors of basic science researchers to inform the development of customized library services.

Methods: A qualitative study using semi-structured interviews was conducted on a sample of basic science researchers employed at a university medical school.

Results: The basic science researchers used a variety of information resources ranging from popular Internet search engines to highly technical databases. They generally relied on basic keyword searching, using the simplest interface of a database or search engine. They were highly collegial, interacting primarily with coworkers in their laboratories and

colleagues employed at other institutions. They made little use of traditional library services and instead performed many traditional library functions internally.

Conclusions: Although the basic science researchers expressed a positive attitude toward the library, they did not view its resources or services as integral to their work. To maximize their use by researchers, library resources must be accessible via departmental websites. Use of library services may be increased by cultivating relationships with key departmental administrative personnel. Despite their self-sufficiency, subjects expressed a desire for centralized information about ongoing research on campus and shared resources, suggesting a role for the library in creating and managing an institutional repository.

INTRODUCTION

In fall 2005, Dana Medical Library at the University of Vermont (UVM) established a formal liaison program to serve patrons in the college of medicine (COM), college of nursing and health sciences, and its primary teaching hospital, Fletcher Allen Health Care (FAHC). The program involved assigning academic departments and programs to specific librarians to provide instruction, conduct literature searches, advocate for collection needs, and serve as a conduit for communication between the library and its patrons. After two years, distinct differences in the level of response to the liaisons' efforts among the various departments in the COM became apparent. From the first year to the second year of the liaison program, interactions between the library and the clinical departments increased by over 50%, whereas the number of interactions between the library and basic science departments remained the same. Seeking an explanation for the different responses, the librarians realized that their knowledge of the information needs and behaviors of researchers in the basic science departments was minimal at best.

Because the library already had ample data about use of its resources through journal use studies and circulation statistics, a decision was made to focus instead on the information-seeking behavior of this



This article has been approved for the Medical Library Association's Independent Reading Program <<http://www.mlanet.org/education/irp/>>.



A supplemental appendix is available with the online version of this journal.

Highlights

- Basic science researchers rely on a small network of individuals in their institution and at other institutions to satisfy their information needs.
- Basic science researchers tend to ignore institutional boundaries when searching for information and do not necessarily view the library as the primary source of scholarly information.
- Basic science researchers use the interlibrary loan service regularly but otherwise rarely use traditional library services such as mediated literature searching and instruction.

Implications

- The library must establish a presence in researchers' work environments, rather than expect them to seek out library resources and services.
- The increased emphasis by funding agencies on clinical translational science may impact the information needs of basic science researchers in the future.
- Libraries have an opportunity to capitalize on their positive reputation and basic scientists' desire for more centralized information to create new information resources and services such as institutional repositories.

population and how it applies to library services. A team of four librarians was formed to study the unique information-seeking habits of basic science researchers in the UVM College of Medicine, with the

ultimate goal of designing a suite of library services that would better meet their needs. In particular, the team sought to determine how faculty researchers in the basic sciences find the information they need and what library services are useful to them.

In his 2002 survey of research on information-seeking behavior, Case reported that "Information seeking is a topic that has been written about in over 10,000 documents from several distinct disciplines" [1]. Examining the literature since 2000, the team discovered several behavior studies of academic researchers, including physical scientists, life scientists, social scientists, and humanists [2–4]. Many other studies have been published that focus on the information-seeking behavior of health care practitioners in a wide range of occupations and settings [5–27]. However, "Researchers and clinicians, even those in the same college, often have very different information needs," with clinicians requiring quick, concise information and researchers requiring more in-depth information [28]. Only a few studies were found that focused on the information-seeking behavior of basic science researchers [29–31].

A majority of these user behavior studies employed surveys and questionnaires to gather descriptive data on the information-seeking behaviors of various groups, with many of them focusing on the library resources used, but not necessarily the library services needed [5, 7, 8, 10, 13–15, 17, 19, 21, 23, 25–27]. Although such studies might indicate how often various resources or services are used, they do not explain why patrons choose a particular resource or service or why basic science researchers do not use the library in general. In a similar manner, information from studies using surveys is limited by the number of questions that can be reasonably asked, structure of the questions, and choices provided [32].

In contrast, in his early work on methodologies for studying information-seeking behavior, Ellis argued for a "micro-approach involving more intensive study of more groups via observation and unstructured interview techniques." He claimed that "qualitative research design better lends itself to uncovering information-seeking behavior" [33]. Case agreed that if researchers are seeking a detailed picture of information usage, they might consider close observation of a small number of users [1]. Some studies identified by the literature review did just that, using semi-structured interviews or observational methodologies alone or in conjunction with survey instruments [7, 11, 12, 15, 16, 20, 26, 34]. Noting that these studies provided the desired in-depth, qualitative information, the team chose a semi-structured interview methodology.

METHODOLOGY

Setting

UVM is a land-grant institution in northern Vermont with 7 undergraduate schools and colleges, a gradu-

ate college, and the COM. In 2008, the COM had 415 students and over 1,300 faculty, including full-time instructional faculty, research faculty, clinical instructors, adjunct faculty, faculty holding secondary appointments, community preceptors, and hospital residents. The COM includes 5 basic science departments that employ more than 65 full-time faculty members with various appointments and rank, as well as postdoctoral fellows and laboratory technicians (Table 1).

The university is served by five libraries: Bailey-Howe Library (the main undergraduate/graduate library), Dana Medical Library, Cook Chemistry/Physics Library, and two off-site storage facilities. A department in the UVM Libraries, Dana Medical Library currently employs seven full-time and three part-time librarians. It serves the university's health sciences colleges, the health professionals of FAHC hospital, and the university at large. Because of the relative autonomy of the COM from the university proper and the status of the teaching hospital as an independent organization, the library essentially serves three distinct communities of users, each with their own administrations, computer networks, software programs, and educational courseware.

Methods

After reviewing the published literature on research methodology for studying information-seeking behavior, the team chose a semi-structured interview method for the study. Team members began the process by identifying the entire scope of questions they had regarding the basic science researchers' information-seeking behaviors. Questions were also developed to gather information from subjects that would inform future decisions about library services, such as educational programming. From this, a final list of interview questions was drafted (Appendix, online only), and the team made sure the questions were sufficiently open ended to avoid leading subjects' answers, while encouraging free discussion on the topics. Follow-up questions were also scripted, and interviewers were permitted to clarify questions or ask unscripted follow-up questions when appropriate. In the team's review of studies using semi-structured interview techniques, it became apparent that maintaining such flexibility in the interview process was crucial to engaging subjects in a conversation of the issues [35, 36].

Table 1
Composition of University of Vermont College of Medicine

Patron group	Overall	Basic science
Students	410	36
Total faculty	461	67
Tenure track faculty	157	39
Research faculty	83	28
Clinical faculty	221	0
Postdoctoral students and fellows	59	33
Lab technicians	89	39

The instrument was developed and piloted on one test subject, resulting in minor modifications to the interview procedure, including preparing definitions of library jargon such as “institutional repository,” “curriculum-based instruction,” and “database” for interviewers to use when needed. Exempt status was sought from the institutional review board and granted in order to conduct the study on human subjects. Participation was voluntary, and no compensation was offered. Measures were taken to protect the confidentiality of participants. The study was initiated October 2007 and completed in March 2008.

Departmental websites were browsed to identify faculty members who were involved in a research project at the time. Potential subjects were selected from across the spectrum of gender, age, and experience in order to create a final subset that would be representative of the COM research faculty. Eighteen faculty members from the five COM basic science departments were invited by email to participate in the study. The objectives of the study were explained to the potential participants, and they were informed that the interview would take approximately forty-five minutes. Eight subjects agreed to participate. Because no major changes were made to the test instrument following the pilot, that interview was included in the study as well, resulting in a total of nine subjects. The nine subjects had appointments in biochemistry, microbiology and molecular genetics, molecular physiology and biophysics, anatomy and neurobiology, and mathematics and statistics, and they represented a range of research and teaching responsibilities (Table 2).

Each subject was interviewed by two people from the study team, one to ask questions and one to take notes. With the subjects’ permission, the interviews were audiotaped. Each subject was asked the same questions, although follow-up questions varied according to subjects’ responses to the original questions. Notes for each interview were compiled and stored in separate files. The notes were also collated by question, so that the answers to a given question from all nine participants could be analyzed together. Working independently, each of the four team members reviewed the original notes from the interviews and audiotapes to identify the major concepts and themes that emerged from each interview. Team members then shared their observations with the group, and together they composed a final list of predominant themes. Next, these common themes were categorized into five broad topics: information sources, search techniques, work environment, current library services, and potential library services.

RESULTS

Information sources

In response to the question about what search engines and databases they regularly used, the nine basic

Table 2
Test subject characteristics (n=9)

Characteristic	Number
Appointment	
Research faculty	4
Tenure-track faculty	5
Clinical faculty	0
Rank	
Assistant professor	2
Associate professor	5
Full professor	2
Gender	
Male	5
Female	4

science researchers who participated in the study strongly preferred online resources to print resources. Two participants provided a reason for their preference, one indicating that online access was more convenient and the other appreciating its immediacy. None of the participants mentioned the library website as their first choice for accessing online resources. One participant was particularly critical of the library website, describing it as “really painful” to use. Most participants reported starting their searches with either PubMed or Google, depending on the nature of their information needs. Four researchers mentioned using subscription databases, specifying Web of Science, SciFinder Scholar, UpToDate, PsycINFO, and Ovid MEDLINE. It was not clear from the interviews whether the researchers were accessing these resources via the library website, or if they had them bookmarked or listed on departmental websites. Two participants reported using the library website’s electronic journal title list to access a known title. Participants also mentioned using table-of-contents alerts, publisher websites, and other miscellaneous resources.

Participants described different approaches to finding information, based on the purpose of their searches. One researcher used Wikipedia to gain an understanding of what students might read about a topic. Another researcher used Google to prepare for classes and PubMed for research. One participant described using UpToDate for clinical information but not for research. Two researchers mentioned using the genetics and molecular biology databases from the National Center for Biotechnology Information (NCBI). The following databases were mentioned by one researcher each: a crystal structure database, the Computer Retrieval of Information on Scientific Projects grants database, an amino acid–sequence database, a three-dimensional structure database, the Highwire Press archive, an oral pathogens database, and Google Scholar.

Search techniques

As a group, the researchers used a wide variety of resources and search techniques, though individually they relied on only a few favorites. In answer to the

interview question, "How do you find what's written on a given topic?", four participants began by searching for broad or background information. Two researchers specifically mentioned looking for review articles, while three turned to books and book chapters. Google was mentioned as a starting point by four researchers, two of whom specifically used Google to locate books, book chapters, and presentations. One researcher would ask a colleague to help her learn about a new field.

After gathering background information, participants then conducted searches of the primary literature for more specific information. Seven researchers used PubMed for this step, one used Ovid MEDLINE, and one used Highwire Press. One researcher reported that she often tried to identify the leading scholars in the field and then searched for their publications. She was also inclined to email experts in the field for information. Three researchers mentioned following up on references in bibliographies, and one researcher indicated that she traced references forward. Despite the range of techniques employed, only two participants described using more than a few of them.

When searching a database, participants typically chose the simplest interface offered. For example, five researchers used Google, but only one searched Google Scholar. The four researchers who described their approach to searching PubMed reported that they used keywords and basic search techniques. Only one of the nine participants mentioned using a database's more advanced search features.

When asked how they kept on top of developments in their fields, interviewees regularly mentioned alerting services that they had set up for themselves. Three researchers received tables of contents via email. Four participants set up their own subject-based alerts: two in My NCBI, one in the American Chemical Society's ASAP Alerts service, and one through a locally developed interface to assist in searching PubMed. One researcher admitted that she was not keeping up very well.

Work environment

Although none of the eight interview questions specifically addressed communication with colleagues, six of the questions elicited responses indicating that the participants received help from their colleagues in current or previous work groups. Three researchers specifically mentioned the importance of professional meetings in keeping up to date. Two researchers indicated that colleagues in general were important for staying on top of new developments. One professor found that serving as a peer reviewer of grants and journal articles helped him stay current. One participant learned about new search engines and databases through colleagues. Four participants used contacts at other universities to obtain copies of journal articles that were not available through UVM subscriptions.

Participants were interested in receiving communications from the library about library events and resources, especially newly acquired online journals. Eight participants preferred email communications, while one expressed a strong preference for print flyers. Two researchers from the same department recommended communicating through their department administrators, who would then redistribute the information as appropriate. Overall, the participants exhibited a positive attitude regarding the library. One researcher commented that seeing the library full of students gives a good impression to potential recruits.

Current library services

Six of the nine researchers reported using the libraries' interlibrary loan service. Three participants had not been aware of the document delivery service to obtain copies of articles from the libraries' journal collections but, after it was described, would consider using it in the future. Five researchers had received help from a librarian in using EndNote, and two more would consider asking for EndNote help. Five researchers had used email or telephoned the reference desk for help in accessing a specific online journal article. Experience with mediated literature searching was mixed, with one researcher praising the service and another finding it less useful. Four of the interviewed researchers had successfully accessed databases and electronic journals from off-campus, but one participant did not know that off-campus access was possible. One researcher suggested that the library could provide meeting space, which the library already did. Another participant suggested the library start a program in which researchers interact with individual librarians with subject expertise. The library had created a liaison program, but apparently that individual was not yet aware of its existence. There was a universal lack of awareness of the subject guides available on the library's website, though two participants did express interest in them. Two researchers indicated that their departments maintain their own version of a subject guide on the departmental websites.

Only two researchers anticipated attending classes to learn about searching databases they did not currently use. All participants performed their own literature searches, and most would not turn to the library for help if they encountered problems. However, prompted by the interview question, one participant decided to make an appointment with a reference librarian for a research consultation. According to one researcher, graduate students learn how to search from peers and mentors in the labs where they work, so there is not much need for library classes for graduate students. However, another researcher suggested offering classes to incoming graduate students in conjunction with their orientations. Other participants recommended EndNote training for graduate students and administrative assistants, and two were interested in EndNote classes

for themselves. Four participants were interested in NCBI database training, provided on site by instructors from NCBI.

Potential library services

Participants identified the library as one of only a few centralized university entities and concluded it could serve as one source of university-wide information. Suggestions included creating regularly updated listings of upcoming professional development opportunities, grants awarded to university researchers, and shared UVM resources, both material and intellectual.

Participants were enthusiastic about an institutional repository, though they had different notions about its purpose. Two researchers thought it should contain records for awarded grants as well as published articles, while two others were primarily interested in published articles. Another researcher suggested creating a central repository of images that could be shared in the UVM community for teaching and research purposes. Five participants saw themselves as the primary beneficiaries of a repository and suggested they would use it to find out who is doing what on campus or to obtain journal articles authored by university researchers that are not available through the university's online subscriptions. Two participants suggested that an institutional repository could be useful to university administrators or to prospective students.

DISCUSSION

As long ago as 1991, Cunningham et al. [37] reported that biotechnology researchers used the physical library "less often than anticipated." Since that study, the use of biomedical information online has dramatically exceeded its use in print [30], and it is no surprise that the trend for researchers to perform their research outside of the library has accelerated. The issue, however, is not simply the increase in remote use of resources. Kuruppu and Gruber framed it this way: "university users do not have to come to the physical library to access information," adding that "the communication between the library and the user community, therefore, has become more difficult and challenging" [31].

Challenges in communication are complicated by the fact that researchers do not hold the same assumptions about the role of libraries in accessing information that library professionals do [38]. Libraries, perceiving themselves as the primary source for scholarly information, have made concerted efforts to improve communication with users in the hopes of meeting their information needs. They have done this by instituting liaison programs, creating websites and portals designed to make access to resources easy and convenient, and offering training and instruction in the use of various resources. Despite these efforts, libraries have had limited success in reaching some users.

The basic science researchers interviewed in this study largely ignored institutional boundaries when searching for information. They did not approach their search by asking what their university library had available. Instead, they began with the whole world of information available to them from their desktops. When necessary, access to online documents might involve using old accounts from former employers or obtaining desired documents on a pay-as-you-go basis. Only when a document was not readily available to them online or was too expensive would they consider using the library. Even then, the library competes with colleagues at better-resourced universities who may be able to email a copy of the necessary article before the library's interlibrary loan department could supply it. Furthermore, obtaining an article from a colleague may be more enjoyable than contacting the library and may serve to continue desired relationships. Haglund and Olsson found this to be true in their study of young researchers seeking scientific information, stating that "personal networks are very important to researchers, and ... collaboration between universities is widespread" [38]. Librarians may be disheartened to learn the extent to which their patrons find the information they need outside their institutions' libraries, but the basic science researchers studied here see it as standard practice.

Likewise, the basic science researchers in this study were not interested in receiving training on database searching. As they described their search processes, it became clear that searching bibliographic databases was a small part of conducting a literature review, a finding similar to behaviors described by early models of online search behavior [33, 39].

A gap in perception of the researchers' education needs has emerged between librarians and the researchers themselves. A 2006 study produced by the Research Information Network noted a "divergence of view about searching, with researchers making heavy use of search engines and librarians barely mentioning them as a key tool" [4]. Typical linear literature review classes that begin with defining a search topic, searching a specific database, and finishing with evaluating results do not acknowledge the complex and dynamic process that basic science researchers follow. Though the basic science researchers in this study did use primary literature databases as part of their search process, their use was embedded in a larger, organic process that incorporated reading background sources, identifying key researchers, and following references from bibliographies, moving back and forth between these activities as they learned more. Bates referred to this assortment of strategies as "berrypicking" [39]. Other findings from the Research Information Network study highlighted that "librarians see it as a problem that they are not reaching all researchers with formal training, whereas most researchers don't think they need [training] at all" [4]. Haglund and Olsson described this phenomenon even more directly:

when it comes to library user education, many researchers feel they have no need for instruction, and library subject specialists are only contacted when the need for exhaustive searches arise, or perhaps when a researcher is new to a subject area. Existing library liaison roles are not utilized to any extent. [38]

While the basic science researchers might not be interacting with the library, as a group they were very collegial within the confines of their work environments. Researchers' activities naturally center on the lab, the people they work with every day, and colleagues working on closely related research in other institutions. As a group, they reported being highly self-sufficient. Graduate students learn research methodology, analysis of results, scholarly communication skills, and literature review skills from their mentors in their labs. Laboratories make their own online subject guides and post them on departmental websites.

Nevertheless, the basic scientists were eager for more interaction with other scientists on campus and expressed a desire for more centralized university services. Such services might include a centrally available list of professional development events, access to lab equipment and expertise in other departments, and an archive of articles produced by UVM authors. Furthermore, the scientists saw the library as a possible coordinator of these services. Though the interviewees did not specifically mention the growing interdisciplinary nature of their research, their desire for more unified services might reflect the increased focus on multidisciplinary and translational research recently advocated by prominent funding agencies. With their focus on colleagues in their own labs and in the same field, basic science researchers remain relatively unaware of work going on in other university buildings or even across the hall. This problem is compounded in the UVM biosciences enterprise by the administrative and computing system divisions between UVM main campus, the COM, and its affiliated medical center. Expecting to find solitary scientists who were content to work in intellectual silos, the authors found just the opposite: a collegial group who desired greater collaboration with related and overlapping disciplines.

Haglund and Olsson faulted libraries for "focusing too much on the perceptions of the library staff, instead of the needs of the users," and recommended "dialogue on more equal terms, as opposed to the usually completely one-sided distribution of information from the library" [38]. It has been argued that the library needs to be seen as an active partner in the patron's community [31]. In a recent article, Harris stated, "Before we make assumptions about how to assist communities of learning, we may also need to define and navigate the social, political, and cultural characteristics of that community" [40]. The current study found that basic science researchers valued and relied heavily on their community and desired even more collegiality. Clearly, if libraries' services and resources are to be useful to these patrons, they need

to be easily accessible and integrated into the work life of this user group.

Notable in this study was the users' limited awareness of library services and the need for improved communication. However, the solution is not simply to increase communications from the library, but to fundamentally change the modes of communication. A study of National Institutes of Health researchers revealed the need to "continually strive for integration of information resources and services into users' workflow" [29]. Communication, it seems, is "better received if it is channeled through individuals the students and faculty know" [31] and more effective when the librarian is recognized as an "everyday presence ... in the research environment" [38]. When providing web resources, the library should perhaps try to establish a presence on the researchers' departmental web pages rather than rely on researchers to begin their information seeking at the library's website. Just as librarians are rethinking the role of the reference desk [41], they may want to consider the limitations of a library website that waits for patrons to visit. Some of the investment currently devoted to a library website might better be diverted to more proactive efforts to integrate that information into sites that researchers are already using.

The basic science researchers in this study consistently favored receiving emails from the library and suggested using departmental administrative assistants to pass on news as appropriate. Perhaps by developing a close relationship with departmental administrative assistants and finding ways to infiltrate the researchers' work group, the library can more effectively communicate with this group. Other librarians have recommended going even further to create an "informationist" who combines the expertise of the librarian with the subject expertise in a biomedical field [42, 43], though barriers to developing such a program, including training and cost, have been identified [44].

STUDY LIMITATIONS

Despite attempts to avoid the use of library jargon and to define terms, some vocabulary used in the interview questions might have been unfamiliar to the interviewees. Though the interview questions were intentionally vague so as to reveal the entire spectrum of scientists' information-seeking behavior, some of the questions were so broad that they might have been difficult to answer. Furthermore, the subjects often assumed that the questions were limited to library resources and services, presumably because librarians were conducting the study. The degree to which subjects provided the responses they thought librarians wanted to hear or focused unconsciously on library-related resources and behaviors is difficult to determine. To counteract this, the interviewers began each interview by encouraging their subjects to consider information-seeking activities that went beyond the scope of the library. Participants might have wanted to appear more knowledgeable to their

librarian colleagues by mentioning certain resources or embellishing their search techniques. Testing the instrument on more than one test subject may have revealed some of these design flaws and allowed for their correction.

Because potential subjects were not offered any kind of incentive, it is possible that those who agreed to participate did so out of interest in the subject matter, thus introducing the possibility of volunteer bias. The interviewers, as librarians, could not be completely unbiased and might have inadvertently steered the researchers toward desired responses. In addition, the use of multiple interviewers undoubtedly introduced variation in the participants' responses. Finally, the demographics of the participants limited the generalizability of this research. There were only nine participants, they were at very different points in their careers, and they had a wide variety of research interests. Other groups who might have been included in the study—such as graduate students, postdoctoral fellows, and laboratory technicians—were not represented.

CONCLUSIONS

This study has found that the library must fundamentally change the way it sees itself in relation to basic science researchers and perhaps other user groups as well. Libraries must acknowledge that they are not the only source of information for their users: patrons find the information they need through a variety of methods and in many places instead of the library. If libraries wish to make library resources and services more valuable to patrons, they would do well to revise their library-centric view and instead integrate resources and services into their users' work lives. Librarians need to find ways to make themselves a routine part of their patrons' work. Librarians who have established a presence in the basic science departments, either physically or virtually, can offer access to resources and solutions to specific problems at the point of need. As librarians go beyond simply communicating their skills, services, and resources to demonstrating them in the context of patrons' work environments, they will increasingly be seen as integral members of the research community.

Librarians at the Dana Medical Library have made several specific changes to library services in response to the study findings. Learning that a particular department was interested in graduate student orientations to the library, one librarian successfully scheduled them simply by working with the administrative assistant of that department. Other librarians discovered ways to insert their online subject guides into course management software and departmental web pages. The administrative assistants' reception was expanded this year, and the library is looking to purchase more online resources designed specifically for use in the basic sciences. Partnerships with other departments in the university that frequently interact with scientists, such as the office of sponsored programs, may also be pursued.

The research raises some new questions: Should less time and energy be devoted to developing the library website for basic science researchers and more spent on integrating resources or services into their departmental websites? Should physical activities, such as workshops and exhibits, always have a virtual counterpart? How can the results of this study be used to begin work on an institutional repository?

The team found that the structured interview methodology provided rich data concerning the information-seeking behavior of basic science faculty and offered insights that could not have been obtained with a survey or usage study. The team would like to expand on these findings by gathering information about specific elements by using other types of research methodologies. For example, one of the subjects expressed a desire for an online protocols database made available through the library. A survey could easily be conducted to identify which of the various available products would best satisfy the basic science researchers' needs, thus informing the library's acquisitions decisions. Focus groups could be used to explore the idea of "centralization" and the ways the library could contribute to this effort. Though centralization may offer obvious benefits, it also requires that participants relinquish some control. The desired balance between benefit and control can best be explored through a moderated focus group discussion among interested parties.

The methodology employed in this study was found to be very effective and could readily be used to study other patron groups. Though the target population was narrowly defined, the information elicited is potentially applicable to a wide range of patron populations. The degree to which other patron populations behave similarly will influence the applicability of this study's findings to the range of services provided by all types of libraries.

REFERENCES

1. Case DO. Looking for information: a survey of research on information seeking, needs, and behavior. Boston, MA: Academic Press; 2002.
2. Herman E. End-users in academia: meeting the information needs of university researchers in an electronic age. *Aslib Proceedings*. 2001 Oct;53(9):387-401.
3. Voorbij H, Ongerling H. The use of electronic journals by Dutch researchers: a descriptive and exploratory study. *J Acad Libr*. 2006 May;32(3):223-37.
4. Research Information Network. Researchers and discovery services: behaviour, perceptions and needs [Internet]. London, UK: The Network; 2006 [rev. Nov 2006; cited 19 Feb 2009]. <<http://www.rin.ac.uk/files/Report%20-%20final.pdf>>.
5. Andrews JE, Pearce KA, Ireson C, Love MM. Information-seeking behaviors of practitioners in a primary care practice-based research network (PBRN). *J Med Libr Assoc*. 2005 Apr;93(2):206-12.
6. Brown SR, Roush JR, Lamkin AR, Perrakis R, Kronenfeld MR. Evaluating the professional libraries of practicing physical therapists. *J Med Libr Assoc*. 2007 Jan;95(1):64-9.

7. Bryant SL. The information needs and information seeking behaviour of family doctors. *Health Info Libr J*. 2004 Jun;21(2):84–93.
8. Cogdill KW. Information needs and information seeking in primary care: a study of nurse practitioners. *J Med Libr Assoc*. 2003 Apr;91(2):203–15.
9. Coumou HCH, Meijman FJ. How do primary care physicians seek answers to clinical questions? a literature review. *J Med Libr Assoc*. 2006 Jan;94(1):55–60.
10. Dee C, Stanley EE. Information-seeking behavior of nursing students and clinical nurses: implications for health sciences librarians. *J Med Libr Assoc*. 2005 Apr;93(2):213–22.
11. Gonzalez-Gonzalez AI, Dawes M, Sanchez-Mateos J, Riesgo-Fuertes R, Escortell-Mayor E, Sanz-Cuesta T, Hernandez-Fernandez T. Information needs and information-seeking behavior of primary care physicians. *Ann Fam Med*. 2007 Jul–Aug;5(4):345–52.
12. Gorman PN, Yao P, Seshadri V. Finding the answers in primary care: information seeking by rural and nonrural clinicians. *Stud Health Technol Inform*. 2004;107(pt 2):1133–7.
13. Guo R, Bain BA, Willer J. Results of an assessment of information needs among speech-language pathologists and audiologists in Idaho. *J Med Libr Assoc*. 2008 Apr;96(2):138–44. DOI: 10.3163/1536-5050.96.2.145.
14. Jette DU, Bacon K, Batty C, Carlson M, Ferland A, Hemingway RD, Hill JC, Ogilvie L, Volk D. Evidence-based practice: beliefs, attitudes, knowledge, and behaviors of physical therapists. *Phys Ther*. 2003 Sep;83(9):786–805.
15. Kim GR, Bartlett EL Jr, Lehmann HP. Information resource preferences by general pediatricians in office settings: a qualitative study. *BMC Med Inform Decis Mak*. 2005;5:34.
16. McKnight M. The information seeking of on-duty critical care nurses: evidence from participant observation and in-context interviews. *J Med Libr Assoc*. 2006 Apr;94(2):145–51.
17. Nail-Chiwetalu B, Ratner NB. An assessment of the information-seeking abilities and needs of practicing speech-language pathologists. *J Med Libr Assoc*. 2007 Apr;95(2):182–8, e56–7. DOI: 10.3163/1536-5050.95.2.182.
18. Perley CM, Gentry CA, Fleming AS, Sen KM. Conducting a user-centered information needs assessment: the Via Christi Libraries' experience. *J Med Libr Assoc*. 2007 Apr;95(2):173–81, e54–5. DOI: 10.3163/1536-5050.95.2.173.
19. Powell CA, Case-Smith J. Information literacy skills of occupational therapy graduates: a survey of learning outcomes. *J Med Libr Assoc*. 2003 Oct;91(4):468–77.
20. Ramos K, Linscheid R, Schafer S. Real-time information-seeking behavior of residency physicians. *Fam Med*. 2003 Apr;35(4):257–60.
21. Renwick S. Knowledge and use of electronic information resources by medical sciences faculty at The University of the West Indies. *J Med Libr Assoc*. 2005 Jan;93(1):21–31.
22. Revere D, Turner AM, Madhavan A, Rambo N, Bugni PF, Kimball A, Fuller SS. Understanding the information needs of public health practitioners: a literature review to inform design of an interactive digital knowledge management system. *J Biomed Inform*. 2007 Aug;40(4):410–21.
23. Secco ML, Woodgate RL, Hodgson A, Kowalski S, Plouffe J, Rothney PR, Sawatzky-Dickson D, Suderman E. A survey study of pediatric nurses' use of information sources. *Comput Inform Nurs*. 2006 Mar–Apr;24(2):105–12.
24. Spenceley SM, O'Leary KA, Chizawsky LL, Ross AJ, Estabrooks CA. Sources of information used by nurses to inform practice: an integrative review. *Int J Nurs Stud*. 2008 Jun;45(6):954–70.
25. Tannery NH, Wessel CB, Epstein BA, Gadd CS. Hospital nurses' use of knowledge-based information resources. *Nurs Outlook*. 2007 Jan–Feb;55(1):15–9.
26. Winters CA, Lee HJ, Besel J, Strand A, Echeverri R, Jorgensen KP, Dea JE. Access to and use of research by rural nurses. *Rural Remote Health*. 2007 Jul–Sep;7(3):758.
27. Xu X, Rocha RA, Bigelow SM, Wallace CJ, Hanna T, Roemer LK. Understanding nurses' information needs and searching behaviour in acute care settings. *AMIA Annu Symp Pro*. 2005:839–43.
28. Tennant MR, Cataldo TT. Development and assessment of specialized liaison librarian services: clinical vs. basic science in a veterinary medicine setting. *Med Ref Serv Q*. 2002 Summer;21(2):21–37.
29. Grefsheim SF, Rankin JA. Information needs and information seeking in a biomedical research setting: a study of scientists and science administrators. *J Med Libr Assoc*. 2007 Oct;95(4):426–34. DOI: 10.3163/1536-5050.95.4.426.
30. Hemminger BM, Lu D, Vaughan KTL, Adams SJ. Information seeking behavior of academic scientists. *J Am Soc Inf Sci Technol*. 2007 Dec;58(14):2205–25.
31. Kuruppu PU, Gruber AM. Understanding the information needs of academic scholars in agricultural and biological sciences. *J Acad Libr*. 2006 Nov;32(6):609–23.
32. Detlefsen EG. The information behaviors of life and health scientists and health care providers: characteristics of the research literature. *Bull Med Libr Assoc*. 1998 Jul;86(3):385–90.
33. Ellis D. Modeling the information-seeking patterns of academic researchers: a grounded theory approach. *Libr Q*. 1993 Oct;63:469–86.
34. Brown CM. Information seeking behavior of scientists in the electronic information age: astronomers, chemists, mathematicians, and physicists. *J Am Soc Inf Sci*. 1999 Aug;50(10):15.
35. Bolduc AP. Surveying user needs in an international context: a qualitative case study from the ILO, Geneva. *Int Inf Libr Rev*. 2008 Mar;40(1):1–9.
36. Pymm B, Lloyd A. Dealing with digital collections: interviews with the National Library and selected state libraries of Australia. *Aust Acad Res Libr*. 2007 Sep;38(3):167–79.
37. Cunningham D, Grefsheim SF, Simon MB, Lansing PS. Biotechnology awareness study, part 2: meeting the information needs of biotechnologists. *Bull Med Libr Assoc*. 1991 Jan;79(1):45–52.
38. Haglund L, Olsson P. The impact on university libraries of changes in information behavior among academic researchers: a multiple case study. *J Acad Libr*. 2008 Jan;34(1):52–9.
39. Bates MJ. The design of browsing and berrypicking techniques for the online search interface. *Online Rev*. 1989 Oct;13:407–24.
40. Harris BR. Communities as necessity in information literacy development: challenging the standards. *J Acad Libr*. 2008 May;34(3):248–55.
41. Carlson S. Are reference desks dying out? *Chron High Educ*. 2007 Apr 20;53(33):A37–9.
42. Whitmore SC, Grefsheim SF, Rankin JA. Informationist programme in support of biomedical research: a programme description and preliminary findings of an evaluation. *Health Info Libr J*. 2008 Jun;25(2):135–41.
43. Rankin JA, Grefsheim SF, Canto CC. The emerging informationist specialty: a systematic review of the literature. *J Med Libr Assoc*. 2008 Jul;96(3):194–206. DOI: 10.3163/1536-5050.96.3.005.

44. Sathe NA, Jerome R, Giuse NB. Librarian-perceived barriers to the implementation of the informationist/information specialist in context role. *J Med Libr Assoc*. 2007 Jul;95(3):270–4. DOI: 10.3163/1536-5050.95.3.270.

AUTHORS' AFFILIATIONS

Laura L. Haines, MLS, Laura.Haines@uvm.edu, Library Assistant Professor; **Jeanene Light, MLS**,

Jeanene.Light@uvm.edu, Library Associate Professor; **Donna O'Malley, MSLIS**, Donna.Omalley@uvm.edu, Library Associate Professor; **Frances A. Delwiche, MLIS**, Frances.Delwiche@uvm.edu, Library Assistant Professor; Dana Medical Library, University of Vermont, 81 Colchester Avenue, Burlington, VT 05405

Received March 2009; accepted July 2009